

ON A NEW INSTANCE OF SYMBIOSIS.

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Some time ago I had the pleasure of bringing under the notice of this society an instance of Symbiosis, in which the organisms were a minute Sea-Anemone and a Bryozoan. (1) The example which I have now to bring forward is not without analogy with this. Last year I described in a preliminary note (2) the general appearance of a new and remarkable species of *Phoronis*, the first that had been found to inhabit Australian Seas. I described the worms as inhabiting spaces or channels in the substance of a wide tube about six inches long, formed of felted threads and having a smooth interior—the heads of the Gephyreans projecting externally. The tube when first discovered was quite empty, and I could not even conjecture what the meaning of this singular structure could be. Fragments of similar colonies have been dredged repeatedly since, and Mr. W. H. Caldwell, who while at Naples made a special study of the Mediterranean *Phoronis hippocrepis*, has more than once obtained large pieces containing many individuals. It was only the other day however, that the mystery regarding this remarkable mode of growth of the *Phoronis* was solved. Mr. Ramsay obtained in a dredge a fortnight ago, specimens which proved not only to contain colonies of *Phoronis australis*, but also the inhabitant of the cavity of the tube in the substance of which the *Phoronis* grows. This proves to be a large Sea-Anemone, of the genus *Cerianthus*.

We have thus here a very remarkable instance of mutual co-operation in two animals belonging to widely different classes. A Sea-Anemone lives in the lumen of a tube the substance of which is inhabited by a colony of *Phoronis*. It is not an instance of mere parasitism or commensalism ; we have plenty of instances

(1.) Proc. Linn. Soc., N.S.W., Vol. VII., p. 608.

(2.) Op. cit., Vol. VII., p. 611.

in which one animal finds it advantageous to take up its abode in the walls of the dwelling of another. But here we have something more. The tube in which the *Anemone* dwells is not formed by the *Anemone* alone, but is partly manufactured by the *Phoronis*. This is proved by an examination of the texture of the tube, which is partly made up of gelatinous threads containing a large amount of the same dark purple pigment found in the integument of the tentacles and front part of the body of the *Phoronis*, and partly of much finer threads.

Among the meshes of the latter, which form the greater part of the thickness of the tube are numerous oval thread-cells, and the thick felt-like substance seems to consist of nothing else than the discharged flagella of these bodies (1). The *Phorones* inhabit transparent membranaceous tubes which run obliquely in the substance of the tube of the *Cerianthus*, projecting usually a little distance beyond the general outer surface of the latter—the mouth directed more or less upwards. The openings of these smaller tubes lie over the whole surface of the large tube; except a short space at the lower end, the tubes themselves form a substantial part of the thickness of the latter, and there can be little doubt from the way in which the threads which seem to be derived from the *Phoronis* are interwoven with those produced by the thread-cells of the *Cerianthus*, and from the intimate manner in which the smaller tubes are interwoven with the tissues of the larger one that the two structures—the colony of *Phoronis* and the protecting case of the sea-anemone—have grown simultaneously.

The symbiosis of a *Sagartia* with a *Pagurus* has been described by Eisig—the hermit-crab permitting the sea-anemone to live on the back of its shell, and the sea-anemone apparently preferring this situation to any other (2). The advantage derived from association with one of the *Actinidae* in all such cases, is

(1). Thread-cells of similar shape occur (with others) in the ectoderm of the body wall of the *Cerianthus*, though not of the tentacles, the nematocysts of the latter being all along and narrow with a spiral thread.

(2). *Dromia excavata*, another of the Anomoura, found in Port Jackson, is almost always found with a colony of *Diazona*, a solid heavy compound Ascidian, growing on its back—the *Diazona* frequently being very many times the bulk and weight of the Crustacean.

dependent on the power which the latter possesses of killing or stunning by the action of its thread-cells small organisms that approach the neighbourhood of its tentacles—a plentiful supply of food being thus provided for the anemone itself and for any other animal, such as the hermit-crab or the colony of *Phoronis* that may live in association with it, and common enemies being at the same time warded off. In return for this the *Phorones* help to build and to strengthen the protecting case in which the *Cerianthus* lives.

ON THE PYCNOGONIDA OF THE AUSTRALIAN COAST,
WITH DESCRIPTIONS OF NEW SPECIES.

[Plates LIV., LV., LVI., LVII.]

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Very few Australian species of Pycnogonida have been described. In the list of the known members of the order given by Hoeck in his Report on the Pycnogonida of the Challenger Expedition (1881) there are only seven Australian species mentioned and of these seven, several are rather to be regarded as belonging to the deep-sea fauna than to the fauna of Australia.

The following is a list of all the Australian forms now known :—

Fam. NYMPHONIDÆ.

- Nymphon validum*, n. sp. Port Stephens.
Nymphon aequidigitatum, n. sp. Port Jackson.
Nymphopsis armatus, n. gen et sp. Port Molle.

Fam. COLOSSENDEIDÆ.

- Ammothea longicollis*, n. sp. Port Jackson.
Ammothea assimilis, n. sp. Port Jackson.